Report on

RECOVERY OF GOLD FROM NOVA SCOTIA SULPHIDE CONCENTRATES

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1. INTRODUCTION

Samples of sulphide concentrate accumulated as a byproduct contain 150-280 g/t gold, which thus makes it a valuable feed material for further processing. Although there are other elements present, e.g., 0.33% Ni, 0.25% Co, and 12 ppm Ag, these quantities are not economic for recovery.

The test work was carried out to establish suitable methods for the recovery of gold. Cyanidation was used on as received samples and also on samples ground to various finenesses. Variables such as pH, pre-aeration, introduction of oxygen by hydrogen peroxide were tested and optimized.

Since the distribution of gold in these concentrates is relatively coarse, shaking tabling was also tested.

2. TEST WORK

2.1 Analysis of head samples

Test work was carried out on three sulphide concentrate samples from Tangier, N.S. (Coxheath).

The head samples were dried and analytical samples were prepared and analyzed as shown in Table 1.

Table 1. Analysis of Head Samples

	Head Sample		
	1	2	3
Au (ppm)	149	280	200
Ag (ppm)	11	17.5	7.4
Zn (ppm)	250	290	365
Cu (ppm)	530	950	500
Pb (ppm)	1026	2960	2110
Co (ppm)	2600	2450	1360
Ni (ppm)	3300	3300	2300
Mn (ppm)	300	650	370
Cd (ppm)	<1	1.3	1.5
Fe (%)	28.0	23.2	26.1
As (%)	20.9	25.0	24.6
S (%)	17.9	17.2	17.1
SiO_2 (%)	15.26	19.81	14.27
CaO (%)	0.36	0.82	0.76
MgO (%)	0.53	0.70	0.63
Al_2O_3 (%)	2.68	3.53	2.92
Na_2O (%)	0.47	0.36	0.32
K_2O (%)	0.54	0.70	0.61
TiO_2 (%)	0.87	2.60	1.18

Sample one weighed 40 kg and samples two and three weighed approximately 700 kg.

31 tests were carried out on sample one to optimize the cyanidation process. Two tests were carried out on sample two and one test on sample three to compare with the test results of sample one.

For tests 1 to 19 cyanidation solution samples for analysis were collected every 24 hours.
For tests 20 to 29 samples were collected after 2, 3, 4, 5, 24 and 48 hours.
For tests 30 to 34 samples were collected every hour up to 10 hours and at 24 and 48 hours.

The head samples were size analyzed at seven sizes and each fraction was analyzed for gold to assess the grades and distributions of each size fraction.

Table 2: Size analysis, grades and distributions of size fractions of head sample 1

Size Range, mm	wt, %	Au, ppm	Dist, %
+ 2	0.5	25.6	0.08
1 - 2	2.0	2962.6	37.57
0.5 - 1	6.6	94.0	3.93
0.25 - 0.5	18.9	255.8	30.65
0.18 - 0.2	21.0	70.4	9.37
0.15 - 0.1	14.6	46.4	4.30
0.075 - 0.15	31.9	35.8	7.24
- 0.075	4.5	240.4	6.86
Cal. Head		157.7	

Table 3: Size analysis, grades and distributions of size fractions of head sample 2

Size Range, mm	wt, %	Au, ppm	Dist, %
+ 2	0.1	4640.0	1.53
1 - 2	1.4	656.0	3.84
0.5 - 1	4.2	425.0	7.32
0.25 - 0.5	18.8	234.0	18.13
0.18 - 0.25	16.6	105.0	7.16
0.15 - 0.18	9.3	86.3	3.30
0.075 - 0.15	37.5	140.0	21.65
- 0.075	12.1	742.0	37.07
Cal. Head		242.8	

Table 4: Size analysis, grades and distributions of size fractions of head sample 3

Size Range, mm	wt, %	Au, ppm	Dist, %
+ 2	0.7	399.0	1.59
1 - 2	7.9	514.0	24.05
0.5 - 1	17.4	350.0	35.86
0.25 - 0.5	31.9	102.0	19.12
0.18 - 0.25	13.8	75.1	6.12
0.15 - 0.18	5.1	52.2	1.56
0.075 - 0.15	18.2	55.0	5.88
- 0.075	5.0	198.0	5.82
Cal. Head		169.9	

Size analysis showed that samples one and two were similar with sample three being coarser (Figure 1). The gold distributions in samples one and three were similar with sample two having less coarse gold.

Samples one and three had high gold distribution above 0.25 mm, 72.2 and 80.6% respectively (Figure 2). In the sample used for test 2, a gold particle larger than 1 mm, weighing 0.0236 g, was found. A test was run to assess the dissolution time for this coarse particle as excessive dissolution time would result in loss of coarse gold in the cyanidation tailing. The particle was leached in a beaker on a magnetic stirrer with 200 mL water, 0.03 g lime (pH 11.1) and 1 g NaCN. After 24 hours, 81.4% of the gold was leached and after 48 hours, when the pH was 10.8, 99.3% was leached. Cyanide consumption was found to be 0.01 g. This indicated that it was unlikely that much coarse gold would be lost in the cyanidation process, mainly because the gold particles were flat.

2.2 Grinding

Coarser grinding was carried out dry in a 6 in. diameter by 11 in. long rod mill with eight rods. Finer grinding was carried out in a 5 in. diameter by 10 in. long paddle mill. All tests used 1000 g of head sample. The paddle mill was used with 2220 g of alumina grinding medium, finer than 4.5 mm and 400 mL water.

A Malvern Laser Diffraction Size Analyzer was used to determine the size analysis of ground products. Size analyses of the rod mill products are given in Table 5.

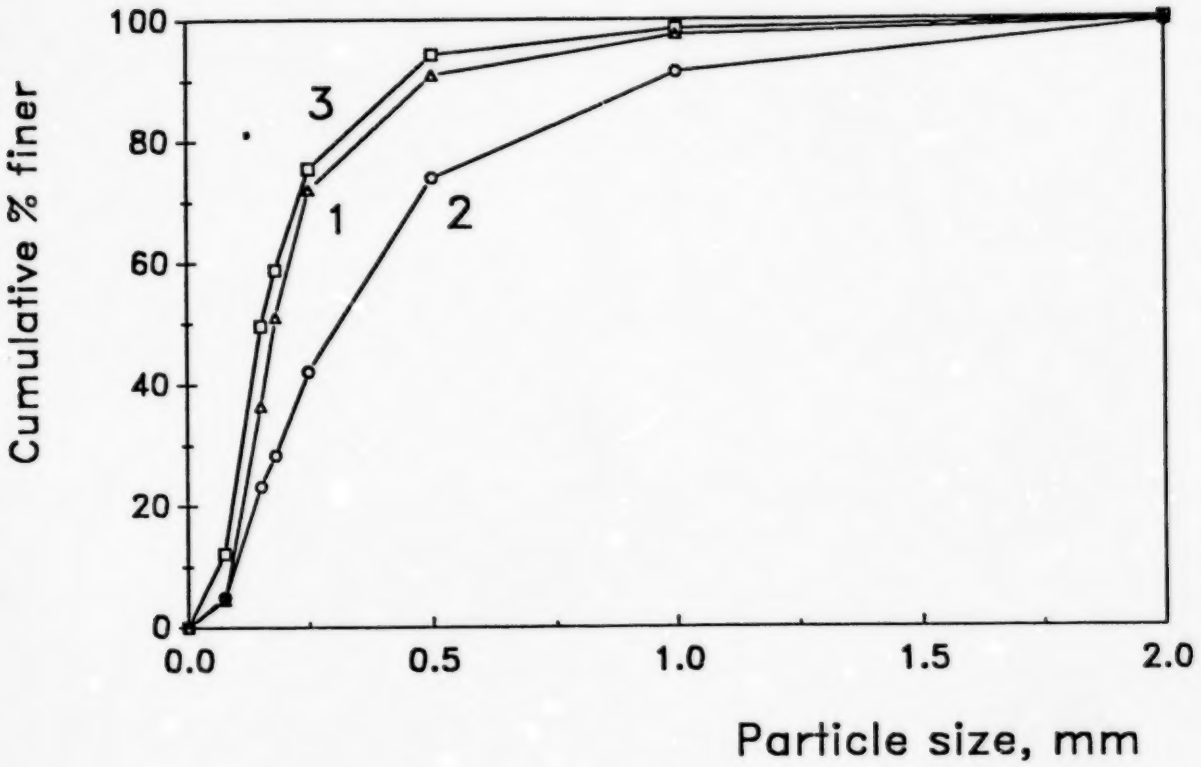

Figure 1: Particle size distributions of the three head samples

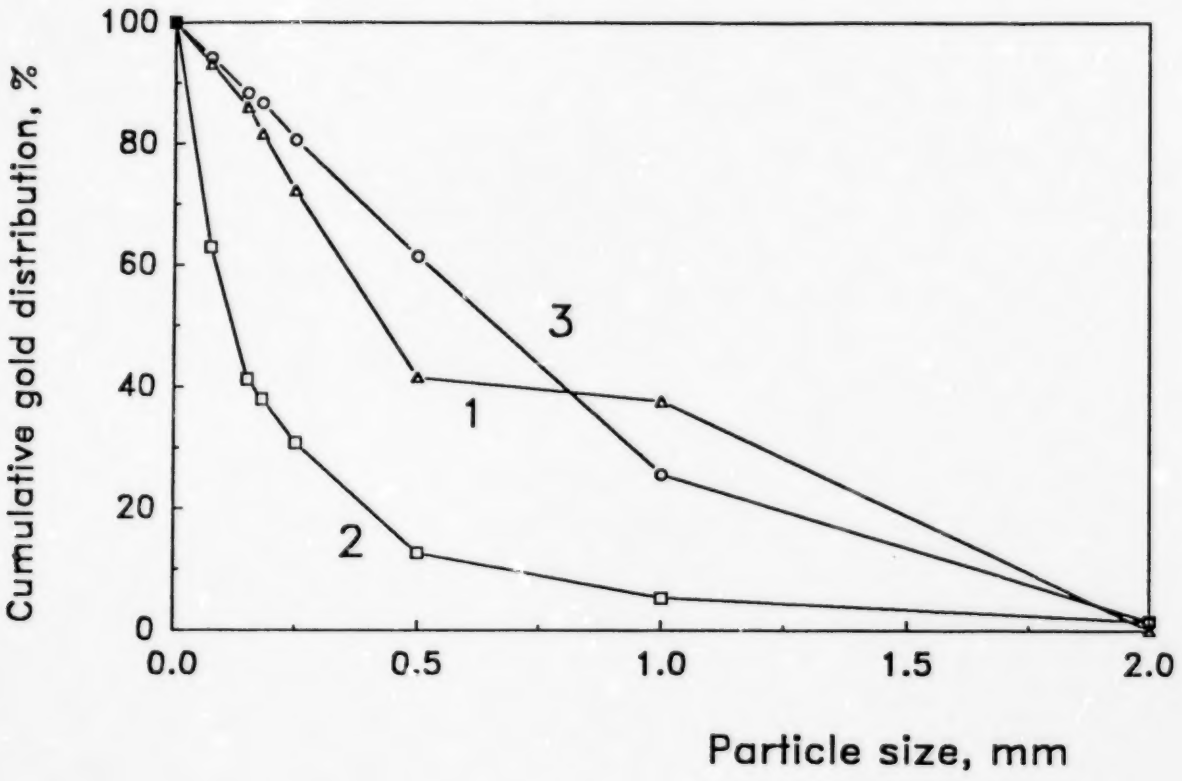

Figure 2: Gold distribution against particle size in the three head samples

Table 5: Size analyses of rod mill ground products used in tests 3 and 4

Size, um	Mass, % finer Test 3	Test 4
180	100.0	100.0
150	99.8	100.0
125	99.0	99.9
106	97.0	99.9
90	93.6	99.9
75	87.6	98.7
63	80.9	94.8
53	74.8	88.5
45	70.3	80.8
38	66.5	73.6
32	62.5	69.2
26.9	58.4	66.0
22.6	54.5	61.7
19.0	50.2	55.8
16.0	45.5	49.8
13.5	40.7	44.9
11.3	35.7	40.2
9.5	31.5	36.0
8.0	27.9	31.7
6.7	23.2	26.1
5.7	18.4	20.9
4.8	13.7	16.2
4.0	10.5	12.4
3.4	8.5	9.7
2.8	6.7	7.7
2.4	5.5	6.4
2.0	3.9	4.6
1.7	2.6	3.1

After paddle milling, the coarser than 75 um was sieved out of the size analysis samples, since the Malvern Particle Size Analyser is unable to size analyse a very wide size range. In the size analysis data the percentages of these fractions are given.

Table 6: Size analyses of paddle mill ground products

	Mass, % finer						
Size,um	Test 1	Test 5	Test 6	Test 7	Test 9	Test 10	Test 11
+75	3.0	2.1	3.1	2.1	12.8	5.3	9.7
75	100.0	100.0	100.0	100.0	100.0	100.0	100.0
63	100.0	100.0	100.0	100.0	100.0	100.0	100.0
53	100.0	100.0	100.0	100.0	100.0	100.0	100.0
45	100.0	100.0	100.0	100.0	100.0	100.0	100.0
38	100.0	100.0	100.0	100.0	100.0	100.0	100.0
32	96.9	100.0	100.0	100.0	87.1	100.0	100.0
26.9	96.3	100.0	100.0	100.0	86.9	100.0	100.0
22.6	95.6	100.0	100.0	100.0	86.3	100.0	90.1
19.0	92.2	97.8	100.0	100.0	82.6	100.0	88.1
16.0	89.0	97.1	96.6	97.5	77.3	94.5	83.5
13.5	86.0	96.0	94.4	96.8	71.5	92.6	76.8
11.3	80.5	93.3	89.1	93.2	63.7	86.7	68.7
9.5	73.4	90.4	82.8	86.2	55.1	79.4	61.0
8.0	65.0	86.7	75.6	77.6	46.7	71.2	52.5
6.7	55.5	80.2	66.1	68.3	38.7	61.4	42.3
5.7	49.0	74.9	59.0	61.3	33.3	54.1	35.8
4.8	42.7	68.6	51.5	53.5	27.9	46.2	30.3
4.0	33.5	57.6	39.8	42.0	20.6	34.5	22.8
3.4	24.7	44.9	30.0	31.1	14.4	24.1	15.9
2.8	16.6	32.1	20.9	21.1	9.0	14.9	9.8
2.4	12.7	25.6	16.2	16.3	6.2	10.3	7.0
2.0	10.0	20.2	12.3	12.6	4.1	6.4	5.1
1.7	8.9	17.6	10.9	10.9	3.3	5.2	4.4
1.4	7.8	15.6	9.4	9.2	2.6	4.1	3.7
1.2	6.6	13.3	8.0	7.8	2.2	3.3	3.2

2.3 Cyanidation

Cyanidation tests were carried out to assess gold recovery as dependent on fineness of grind and pulp pH. The rate of gold dissolution and cyanide consumption as dependent on aeration and hydrogen peroxide addition were also examined. The conditions for cyanidation tests are given in Table 7.

Table 7: Conditions of cyanidation tests

Test No.	Grind Time, min: As Received	Grind Time, min: Rod Mill	Grind Time, min: Paddle Mill	Water Added, L: To Mill	Water Added, L: Leach Test	Aerated	Bottle
1	-	-	60	0.4	1.5	No	Closed
2	Yes	-	-	-	1.5	No	Closed
3	-	60	-	-	1.5	Yes	Open
4	-	90	-	-	1.5	Yes	Open
5	-	-	60	0.4	2.07	Yes	Open
6	-	-	30	0.4	1.86	Yes	Open
7	-	-	45	0.4	2.04	Yes	Open
8	Yes	-	-	-	1.5	Yes	Open
9	-	-	10	0.4	1.87	Yes	Open
10	-	-	20	0.4	1.74	Yes	Open
11	-	-	15	0.4	1.82	Yes	Open
12	Yes	-	-	-	1.5	No	Open
13	Yes	-	-	-	1.5	No	Open
14	Yes	-	-	-	1.5	No	Open
15	Yes	-	-	-	1.5	No	Open
16	Yes	-	-	-	1.5	No	Open
17	Yes	-	-	-	1.5	Yes*	Beaker
18	Yes	-	-	-	1.5	No	Open
19	Yes	-	-	-	1.5	Yes*	Beaker
20	Yes	-	-	-	1.5	No	Open
21	Yes	-	-	-	1.5	Yes*	Beaker
22	Yes	-	-	-	1.5	No	Open
23	Yes	-	-	-	1.5	No	Open
24	Yes	-	-	-	1.5	No	Open
25	Yes	-	-	-	1.5	No	Open
26	Yes	-	-	-	1.5	No	Open
27	Yes	-	-	-	1.5	No	Open
28	Yes	-	-	-	1.5	No	Open
29	Yes	-	-	-	1.5	Yes	Open
30	Yes	-	-	-	1.5	No	Open
31	Yes	-	-	-	1.5	No	Open
32	Yes	-	-	-	1.5	No	Open
33	Yes	-	-	-	1.5	No	Open
34	Yes	-	-	-	1.5	No	Open

* Aerated with compressed air at a rate of 0.5 L/min for duration of the test

Cyanidation was carried out in 10 liter Nalgene bottles or in 2 liter Nalgene beakers for sample aeration, by bubbling with compressed air during tests. Pre-aeration was achieved with a laboratory Denver Sub-A flotation machine for one hour with the air cock fully open. All bottle tests were rotated on rod mill rolls. For two tests the bottles were closed and the rest were carried out with a 1 cm hole in the cap.

Tests 1 to 29 were conditioned for one hour with lime added, either by aeration or on rolls. Tests 30 to 34 had only 5 min. conditioning. After conditioning the pH was taken and cyanide was added to the pulp, then lime and cyanide were added as required. The first tests were discontinued when gold extraction ceased. Later tests with higher rates of cyanidation were stopped after 24 or 48 hours.

In eight tests, hydrogen peroxide was added at the conditioning stage to aid gold extraction. Dosage details are given in Table 8.

Table 8: Hydrogen peroxide additions at the conditioning stage

Test No.	H_2O_2 additions grams	kg/t
18	0.5	0.45
22	0.5	0.45
23	1.0	0.91
24	0.25	0.23
25	0.75	0.68
26	1.5	1.36
27	2.0	1.81
28	4.0	3.63

Details of cyanide additions to the pulp during the cyanidation tests are given in Appendix 1. The tables also contain cyanide consumptions in kg/t and the cumulative cyanide consumption.

Lime additions and cumulative lime consumptions, together with pulp pHs appear in Appendix 2.

Appendix 3 contains details of the 34 cyanidation tests including the amount of gold in solution, gold extracted in ppm, percentage of gold extracted and gold remaining in tailing in ppm.

Tailing from each test sample was also analyzed for gold and the calculated head was determined so that the percentage of gold extracted could be calculated (Table 9).

Table 9: Calculated head grades of the test samples

Test No.	Au, ppm	Test No.	Au, ppm	Test No.	Au, ppm
1	133.95	13	195.00	25	174.47
2	140.20	14	167.40	26	163.90
3	172.45	15	167.45	27	188.13
4	138.60	16	180.60	28	183.57
5	208.25	17	172.05	29	161.09
6	168.70	18	226.15	30	173.11
7	157.85	19	239.68	31	182.88
8	191.65	20	173.50	32	254.60
9	163.05	21	192.00	33	167.57
10	163.80	22	165.73	34	257.57
11	141.95	23	165.34		
12	158.10	24	171.70		

The cyanide leach solutions from the various tests were also analyzed for Ag, Cu, Co, Cd, Ni, Mn, Fe, Zn and Pb, to ascertain the degree of leaching of these elements. The results are given in Appendix 4.

Summaries of the conditions pertaining to each test and gold extractions obtained during cyanidation are given in Appendix 5.

A brief summary of the fineness of grind, starting pH and pH after 24 hours, reagent additions, cyanidation conditions and percentage of gold extracted after 24 hours cyanidation is given for tests carried out on head sample 1 in Table 10.

Table 10: Grinding and cyanidation conditions and gold extracted after 24 hours for head sample 1

Test No.	% Extracted	Microns 80% under	pH Start	pH 24hr	kg/t Addition Lime	kg/t Addition H_2O_2	kg/t Cons. NaCN	Aerated
3	93.2	63	11.80	10.10	3.63	-	1.95	Yes
4	92.0	45	11.60	10.00	3.63	-	1.52	Yes
5	46.9	6.7	7.80	8.50	5.44	-	2.58	Yes
6	89.2	9.0	8.60	9.80	7.25	-	2.11	Yes
7	99.6	8.4	9.80	10.40	9.07	-	1.87	Yes
8	99.0	355	11.70	9.50	1.81	-	1.54	Yes
9	20.6	17.8	11.80	11.70	9.07	-	0.60	Yes
10	95.5	9.6	9.90	10.30	10.88	-	1.52	Yes
11	19.8	14.7	12.00	11.80	9.07	-	0.70	Yes
12	42.4	355	12.00	11.60	2.72	-	0.84	-
13	51.3	355	11.81	11.18	2.27	-	0.43	-
14	87.6	355	11.58	9.67	1.59	-	1.16	-
15	86.3	355	11.50	10.25	1.36	-	1.16	-
16	85.3	355	11.26	9.82	1.13	-	1.13	-
17	83.5	355	11.26	8.70	1.13	-	1.61	Comp Air
18	94.2	355	11.77	10.05	1.13	0.45	0.86	-
19	63.8	355	11.90	10.66	1.59	-	1.35	Comp Air
20	96.0	355	11.57	9.66	1.36	-	1.45	-
21	71.3	355	10.57	9.42	1.41	-	2.40	Comp Air
22	96.1	355	10.98	9.14	1.60	0.45	1.79	-
23	96.2	355	11.08	9.39	1.60	0.91	1.64	-
24	94.9	355	11.34	9.89	1.41	0.23	1.34	-
25	93.3	355	10.60	9.48	1.15	0.68	1.79	-
26	99.1	355	10.65	9.50	1.14	1.36	1.80	-
27	95.8	355	10.87	9.60	1.00	1.81	1.72	-
28	92.5	355	10.76	9.44	1.16	3.63	1.84	-
29	96.1	355	9.35	9.71	1.20	-	1.53	Yes
30	93.3	355	10.34	9.48	1.13	-	1.51	-
31	89.7	355	10.43	9.28	0.88	-	1.79	-

Starting pH was measured after conditioning addition of NaCN.

Tests 5, 6, 7, 10 and 21 to 28 had one more addition of lime between start and 24 hours.

Tests 29, 30 and 31 had several additions of lime between start and 24 hours.

2.4 Discussion of Cyanidation Results

Test work on the Coxheath sulphide concentrates indicated that pH of the pulp is the single most important factor affecting gold extraction. Diminished gold extraction occurs above pH 11 and below pH 9. The optimum pH for the ores tested appears to be about 10. The gold extracted in

24 hours from seven samples cyanided under similar conditions is shown in Figure 3. All the samples except sample 5 were cyanided as received while sample 5 was paddle milled for 60 minutes. The graph, Figure 3, confirms the general observation for the optimum pH.

Oxygen content of the pulp significantly affected the cyanidation time as aeration of pulps significantly increased the rate of gold extraction. Tests 2 and 8 in Figure 4 clearly illustrate this.

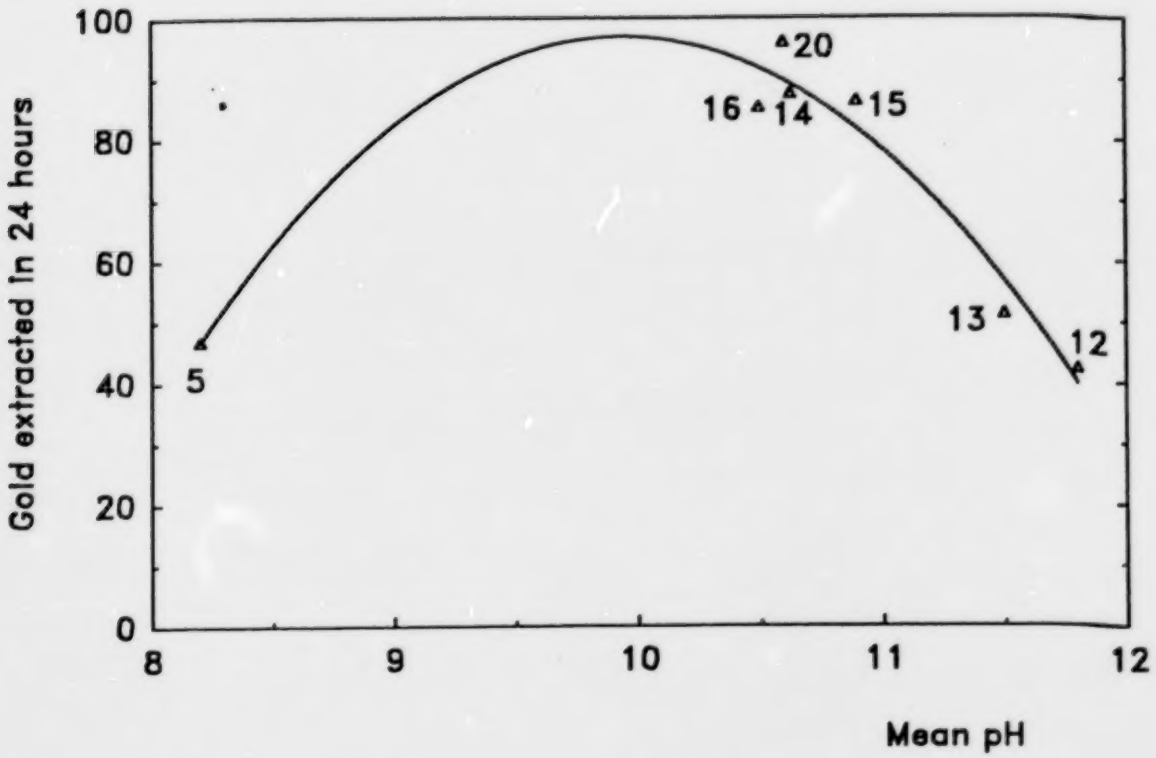

Figure 3: Gold extraction in 24 hours against mean pH of pulp

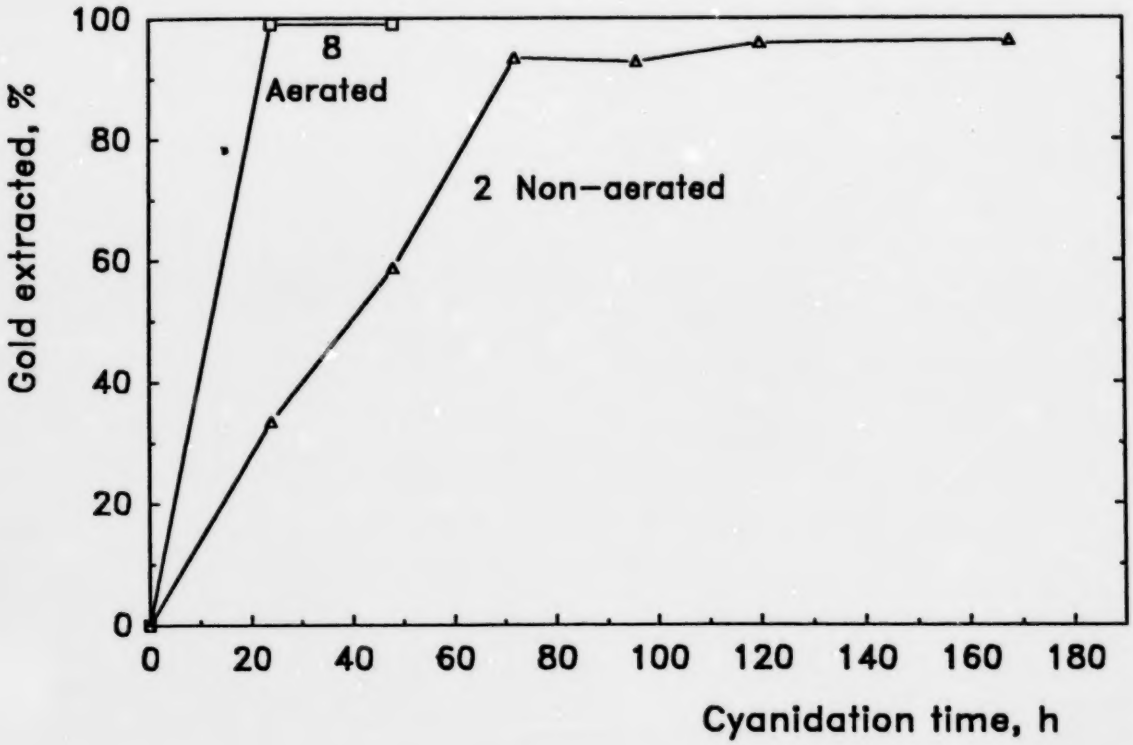

Figure 4: Effect of aeration on gold extraction

Close control of pH allows 96-98% of the gold to be extracted without grinding. Head sample 1 had the lowest cyanidation rate since it was the coarsest of the three and contained approximately 40% of the gold in particles coarser than 1 mm (Figures 1 and 2). This sample requires 24-48 hours cyanidation to achieve the above extraction figure (Figure 5). Head samples 2 and 3 have higher and similar rates of dissolution and these can be cyanided in 8-10 hours. Head sample 2 cyanided quickly because it had very low gold distributions in the coarser size fractions while head sample 3 had the finest size distribution.

Fine grinding allows gold extraction exceeding 99% in 24-48 hours. However, finely ground samples need 3-10 kg/t lime and consume 1.5-2 kg/t NaCN. Without grinding 1.5-2 kg/t lime is required and cyanide consumption is approximately 1.5 kg/t.

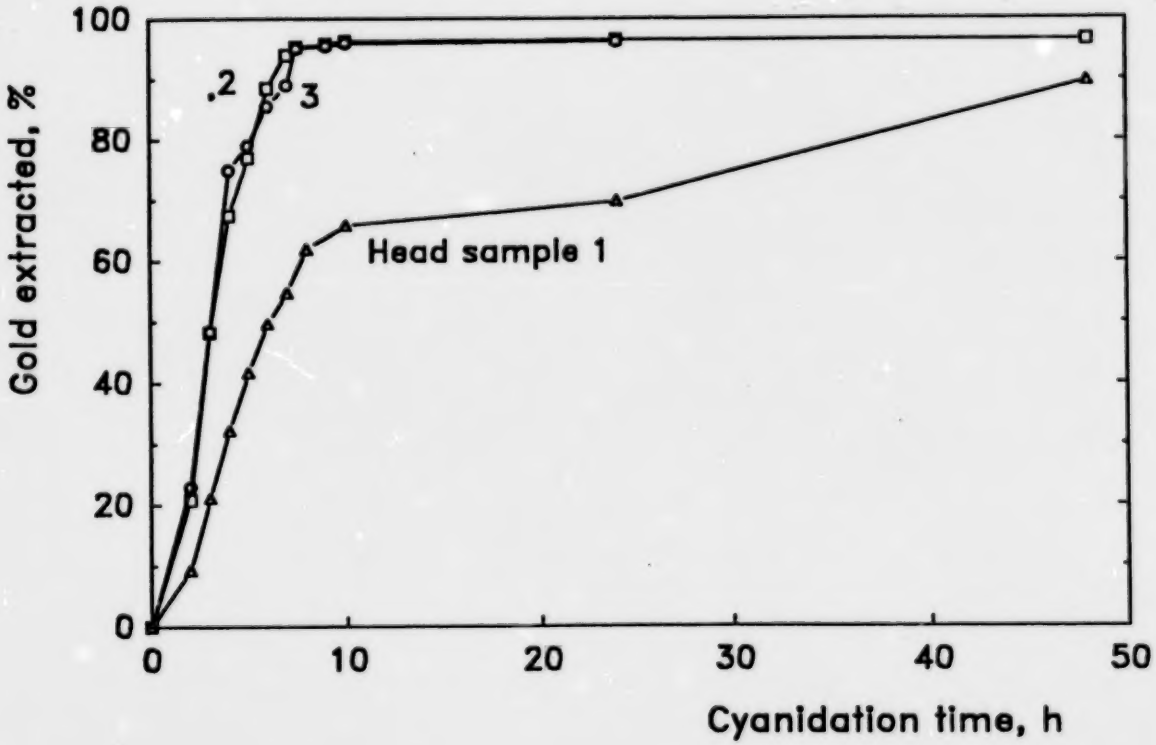

Figure 5: Gold extraction against cyanidation time for head samples 1, 2 and 3 as obtained in tests 31, 32 and 34

Introduction of oxygen into the pulp in the form of hydrogen peroxide considerably increased gold extraction rates but significantly increased lime and cyanide consumptions (Figure 6).

When the pulp in a beaker was aerated at a rate of 0.5L/min for the duration of a test, the gold extraction rate was reduced but the lime and cyanide consumptions increased.

Recovery gold from the pregnant cyanide leach solution by precipitation with activated coconut charcoal (6-14 mesh) was tested and found to be effective. Three filter funnels filled with charcoal were used as columns in series and the solution, containing 142 ppm gold, was introduced. The gold contents of the solution passing through the three columns were measured and gold recovery calculated as shown in Table 11.

Table 11: Gold recovery from pregnant solution using activated charcoal

	ppm Au in solution	% Au Recovered
First column	20.11	85.80
Second column	1.99	98.60
Third column	0.10	99.93

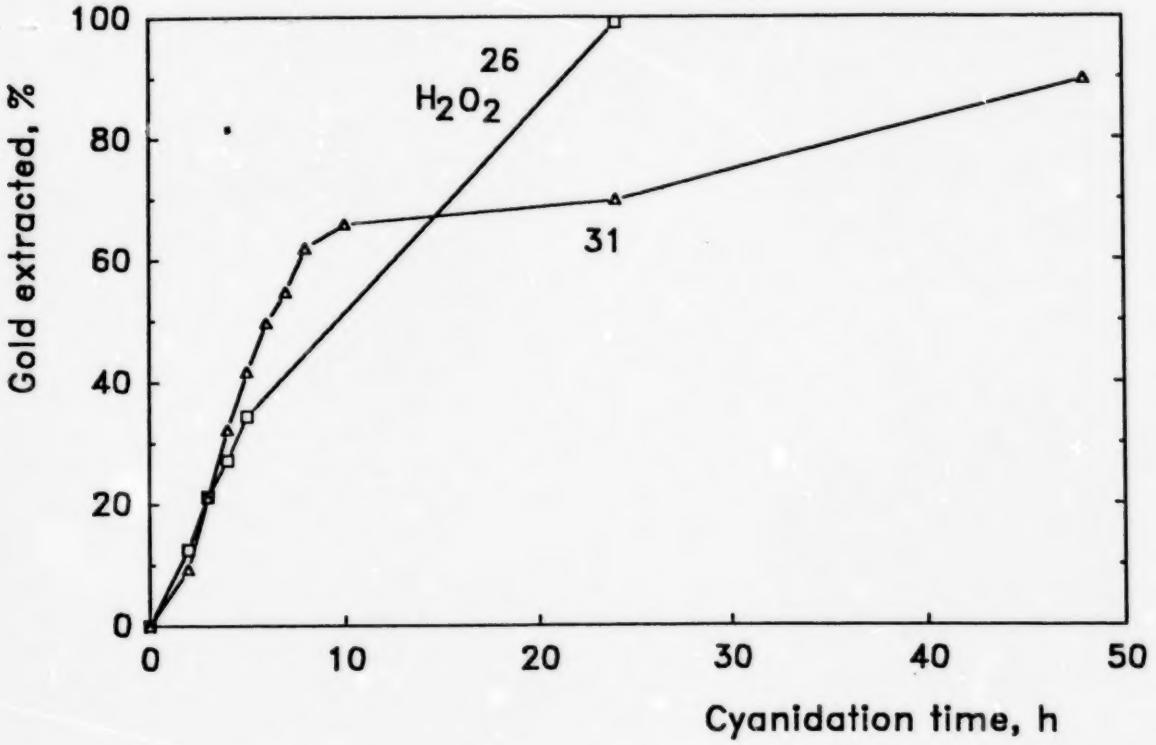

Figure 6: Effect of hydrogen peroxide addition on gold extraction

2.5 Shaking Tabling Test

Shaking tabling tests were carried out on head sample 3. 20 kg of the sample was rod milled in 15" diameter batch rod mill for 45 minutes. The size analysis of the ground product and the gold contents of the size fractions were determined. The gold distributions in the size fractions were calculated as shown in Table 12.

Table 12: Size analysis of shaking table head sample with grades and distributions of size fractions

Size Range, mm	Wt, %	Au (ppm)	Dist, %
+ 1	-	-	-
0.5 - 1	0.04	-	-
0.25 - 0.5	0.83	14575.0	67.34
0.18 - 0.25	10.33	242.0	13.28
0.15 - 0.18	9.10	24.1	1.16
0.075 - 0.15	36.88	38.0	7.44
- 0.075	42.82	47.4	10.78
	Cal. Head	188.31	

For analysis combined +.5 and +.25mm fractions

The ground sample was fed to a half-size Wilfley-Holman shaking table and six products were obtained. The separation results are given in Table 13.

Table 13: Shaking tabling test results

Product	Wt, %	Au (ppm)	Dist, %	Cum Wt, %	Cum Dist, %
Concentrate	1.09	11816.0	57.96	1.09	57.96
Mid 1	11.63	514.0	26.90	12.72	84.86
Mid 2	19.74	100.8	8.96	32.46	93.82
Mid 3	26.87	28.6	3.46	59.33	97.28
Mid 4	17.58	14.0	1.11	76.91	98.39
Tailing	7.51	13.6	0.46	84.42	98.85
Slimes	15.58	16.4	1.15	100.00	100.00
	Cal. Head	222.19			

Although the slimes weight losses were substantial, 15.58%, the gold lost in the slimes was minimal, 1.15%.

Shaking tabling is able to recover about 58% of the gold in 1.09 mass percent concentrate at a grade of 1.18 Au%. By including middling 1, gold recovery will increase to approximately 85% but the grade is reduced to 0.5 Au% and mass percent of the concentrate is 12.7% of the feed. Thus, shaking tabling seems to give a reasonable separation considering that the liberation of the gold is far from complete.

However, when sizing of the ground product at 0.25 mm is considered, the oversize fraction would recover 67.34% gold into a 0.87 mass percent concentrate at a grade of 1.46% Au. Alternatively, sizing at 0.18 mm would give over 80% gold recovery at a grade of 0.15% gold in a concentrate mass equivalent to 11.1% of feed.

From the above it appears that physical separation methods do not give acceptable separation results.

3. CONCLUSIONS

Test work on the Coxheath sulphide concentrates shows that maintaining the pulp pH at about 10 is very important to ensure high gold extraction rates.

Pre-aeration of the pulp significantly increased the rate of gold extraction.

96-98% of the gold is recoverable from the concentrates without grinding. Head sample 1 requires 24-48 hours cyanidation to achieve this recovery, while head samples 2 and 3 need only 10 hours.

Fine grinding allows gold extraction exceeding 99% in 24-48 hours. However, finely ground samples need 3-10 kg/t lime and 1.5-2 kg/t NaCN. Without grinding, 1.5-2 kg/t lime and approximately 1.5 kg/t NaCN is required.

Hydrogen peroxide conditioning increases the rates of gold extraction, but also requires more lime and cyanide.

Continuous aeration during cyanidation appears to be undesirable, giving reduced extraction rates together with increased consumption of lime and cyanide.

Shaking tabling of the ground concentrate allows reasonable upgrading but the recoveries and grades achieved are not adequate.

APPENDIX 1

Cyanide additions and consumptions during cyanidation tests

Test No.	Hours 1	24	44	48	72	96	120	144	168
1 Addition, g	1.0	-	2.0	3.0	3.0	1.0	1.0	1.0	-
Cons, kg/t		0.84	-	1.68	2.42	2.67	0.97	0.84	0.83
Total Cons, kg/t		0.84	-	2.52	4.94	7.61	8.58	9.42	10.25
2 Addition, g	1.0	-	2.0	-	1.0	1.0	-	-	-
Cons, kg/t		0.65	-	0.02	1.01	0.07	0.18	0.45	0.25
Total Cons, kg/t		0.65	-	0.67	1.68	1.75	1.93	2.38	2.63
3 Addition, g	3.0		1.0	-	-				
Cons, kg/t			1.95	-	0.19				
Total Cons, kg/t			1.95	-	2.14				
4 Addition, g	3.0		1.0	-	-				
Cons, kg/t			1.52	-	0.64				
Total Cons, kg/t			1.52	-	2.16				
5 Addition, g	3.0		3.0	-	-	-			
Cons, kg/t			2.58	-	1.44	0.93			
Total Cons, kg/t			2.58	-	4.02	4.95			
6 Addition, g	3.0		2.0	-	-	-			
Cons, kg/t			2.11	-	1.36	0.61			
Total Cons, kg/t			2.11	-	3.47	4.08			
7 Addition, g	3.0		2.0	-	-				
Cons, kg/t			1.87	-	0.71				
Total Cons, kg/t			1.87	-	2.58				
8 Addition, g	3.0		1.0	-	-				
Cons, kg/t			1.54	-	1.07				
Total Cons, kg/t			1.54	-	2.61				
9 Addition, g	3.0		-	-	-	1.0	-		
Cons, kg/t			0.60	-	0.59	0.53	1.34		
Total Cons, kg/t			0.60	-	1.19	1.72	3.06		
10 Addition, g	3.0		1.0	-	-	1.0	-		
Cons, kg/t			1.52	-	0.83	0.54	1.27		
Total Cons, kg/t			1.52	-	2.35	2.89	4.16		
11 Addition, g	3.0		-	-	-	1.0	-	-	-
Cons, kg/t			0.70	-	0.70	0.38	0.75	-	0.54
Total Cons, kg/t			0.70	-	1.40	1.78	2.53	-	3.07
12 Addition, g	3.0		-	-	-	1.0	-		
Cons, kg/t			0.84	-	0.54	0.63	0.23		
Total Cons, kg/t			0.84	-	1.38	2.01	2.24		
13 Addition, g	3.0		-	-	-	-	-		
Cons, kg/t			0.43	-	0.83	0.17	0.18		
Total Cons, kg/t			0.43	-	1.26	1.43	1.61		
14 Addition, g	3.0		-	-	-	-	-		
Cons, kg/t			1.16	-	0.74	0.55	0.06		
Total Cons, kg/t			1.16	-	1.90	2.45	2.51		
15 Addition, g	3.0		-	-	-	-	-		
Cons, kg/t			1.16	-	0.26	0.43	0.27		
Total Cons, kg/t			1.16	-	1.42	1.85	2.12		

Test No.	Hours 1	24	44	48	72	96	120	144
16 Addition, g	3.0	-	-	-	-	-		
Cons, kg/t		1.13	-	0.64	0.43	0.29		
Total Cons, kg/t		1.13	-	1.77	2.20	2.49		
17 Addition, g	3.09	-	-					
Cons, kg/t		1.61	-					
Total Cons, kg/t		1.61	-					
18 Addition, g	3.06	-	-					
Cons, kg/t		0.86	-					
Total Cons, kg/t		0.86	-					
19 Addition, g	3.0	-	-	-				
Cons, kg/t		1.35	-	1.04				
Total Cons, kg/t		1.35	-	2.39				

Test No.	Hours 1	2	3	4	5	24	48
20 Addition, g	3.0	-	-	-	-	-	-
Cons, kg/t		0.29	0.11	0.05	0.14	0.86	1.03
Total Cons, kg/t		0.29	0.40	0.45	0.59	1.45	2.48
21 Addition, g	3.00	-	-	-	-	1.5	-
Cons, kg/t		0.40	0.32	0.11	0.24	1.33	0.72
Total Cons, kg/t		0.40	0.72	0.83	1.07	2.40	3.12
22 Addition, g	3.00	-	-	-	-	-	-
Cons, kg/t		0.50	0.15	0.06	0.44	0.64	0.35
Total Cons, kg/t		0.50	0.65	0.71	1.15	1.79	2.14
23 Addition, g	3.02	-	-	-	-	-	-
Cons, kg/t		0.34	0.18	0.13	0.40	0.59	0.34
Total Cons, kg/t		0.34	0.52	0.65	1.05	1.64	1.98
24 Addition, g	3.03	-	-	-	-	-	-
Cons, kg/t		0.18	0.23	0.10	0.39	0.44	0.30
Total Cons, kg/t		0.18	0.41	0.51	0.90	1.34	1.64
25 Addition, g	3.06	-	-	-	-	-	
Cons, kg/t		0.35	0.21	0.11	0.30	0.82	
Total Cons, kg/t		0.35	0.56	0.67	0.97	1.79	
26 Addition, g	3.11	-	-	-	-	-	
Cons, kg/t		0.28	0.27	0.05	0.41	0.79	
Total Cons, kg/t		0.28	0.55	0.60	1.01	1.80	
27 Addition, g	3.07	-	-	-	-	-	
Cons, kg/t		0.24	0.29	0.11	0.44	0.64	
Total Cons, kg/t		0.24	0.53	0.64	1.08	1.72	
28 Addition, g	3.0	-	-	-	-	-	
Cons, kg/t		0.25	0.38	0.03	0.31	0.87	
Total Cons, kg/t		0.25	0.63	0.66	0.97	1.84	
29 Addition, g	3.01	-	-	-	-	-	
Cons, kg/t		0.43	0.17	0.11	0.24	0.58	
Total Cons, kg/t		0.43	0.60	0.71	0.95	1.53	

	Min.	Hours				
	5	4	8	10	24	48
30 Addition, g	3.00	-	-	-	-	
Cons, kg/t					1.51	
Total Cons, kg/t					1.51	
31 Addition, g	3.01	-	-	-	-	
Cons, kg/t					1.79	
Total Cons, kg/t					1.79	
32 Addition, g	3.01	-	-	-	-	
Cons, kg/t					1.65	
Total Cons, kg/t					1.65	
33 Addition, g	3.01	-	-	-	1.0	-
Cons, kg/t					2.32	1.05
Total Cons, kg/t					2.32	3.37
34 Addition, g	3.01	-	-	-	-	
Cons, kg/t		0.66	0.22	0.12		
Total Cons, kg/t		0.66	0.88	1.00		

APPENDIX 2

Lime additions and corresponding pH values in cyanidation tests

Test No.	Leaching Time, hours								
	Start	1	24	48	72	96	120	144	168
1 Addition, g	2.0	0.5	1.0	2.0	-	1.0	1.0	1.0	-
Addition, kg/t	1.81	0.45	0.91	1.81	-	0.91	0.91	0.91	-
Total Add.,kg/t	1.81	2.26	3.17	4.98	-	5.89	6.80	7.71	-
pH	-	9.9	8.9	8.6	10.1	9.8	10.0	9.7	9.6
2 Addition, g	2.0	-	-	-	-	-	-	-	-
Addition, kg/t	1.81	-	-	-	-	-	-	-	-
Total Add.,kg/t	1.81	-	-	-	-	-	-	-	-
pH	-	11.8	11.0	10.7	10.6	10.5	10.5	10.5	10.4
3 Addition, g	4.0	-	2.0	-					
Addition, kg/t	3.63	-	1.81	-					
Total Add.,kg/t	3.63	-	5.44	-					
pH	-	11.8	10.1	10.6					
4 Addition, g	4.0	-	2.0	-					
Addition, kg/t	3.63	-	1.81	-					
Total Add.,kg/t	3.63	-	5.44	-					
pH	-	11.6	10.0	10.5					
5 Addition, g	3.0	3.0	5.0	-	-				
Addition, kg/t	2.72	2.72	4.54	-	-				
Total Add.,kg/t	2.72	5.44	9.98	-	-				
pH	-	7.8	8.5	10.5	9.2				
6 Addition, g	6.0	2.0	2.0	-	-				
Addition, kg/t	5.44	1.81	1.81	-	-				
Total Add.,kg/t	5.44	7.25	9.06	-	-				
pH	-	8.6	9.8	10.5	9.2				
7 Addition, g	8.0	2.0	1.0	-					
Addition, kg/t	7.26	1.81	0.91	-					
Total Add.,kg/t	7.26	9.07	9.98	-					
pH	-	9.8	10.4	10.4					
8 Addition, g	2.0	-	2.0	-					
Addition, kg/t	1.81	-	1.81	-					
Total Add.,kg/t	1.81	-	3.62	-					
pH	-	11.7	9.5	10.2					
9 Addition, g	10.0	-	-	-	-	-			
Addition, kg/t	9.07	-	-	-	-	-			
Total Add.,kg/t	9.07	-	-	-	-	-			
pH	-	11.8	11.7	11.4	10.5	9.9			
10 Addition, g	10.0	2.0	1.0	-	1.0	-			
Addition, kg/t	9.07	1.81	0.91	-	0.91	-			
Total Add.,kg/t	9.07	10.88	11.79	-	12.70	-			
pH	-	9.9	10.3	10.2	9.7	9.7			
11 Addition, g	10.0	-	-	-	-	-	-		
Addition, kg/t	9.07	-	-	-	-	-	-	-	
Total Add.,kg/t	9.07	-	-	-	-	-	-	-	
pH	-	12.0	11.8	11.7	11.0	10.6	-	9.4	
12 Addition, g	3.0	-	-	-	1.0	-			
Addition, kg/t	2.72	-	-	-	0.91	-			
Total Add.,kg/t	2.72	-	-	-	3.63	-			
pH	-	12.0	11.6	11.5	9.3	10.5			

Test No.	Leaching Time, hours							
	Start	1	24	48	72	96	120	144	168
13 Addition, g	2.5	-	-	-	-	-			
Addition, kg/t	2.27	-	-	-	-	-			
Total Add.,kg/t	2.27	-	-	-	-	-			
pH	-	11.81	11.18	10.68	10.02	9.80			
14 Addition, g	1.75	-	-	-	-	-			
Addition, kg/t	1.59	-	-	-	-	-			
Total Add.,kg/t	1.59	-	-	-	-	-			
pH	-	11.58	9.67	8.88	8.25	8.08			
15 Addition, g	1.50	-	-	-	-	-			
Addition, kg/t	1.36	-	-	-	-	-			
Total Add.,kg/t	1.36	-	-	-	-	-			
pH	-	11.50	10.25	9.65	9.24	8.82			
16 Addition, g	1.25	-	-	-	-	-			
Addition, kg/t	1.13	-	-	-	-	-			
Total Add.,kg/t	1.13	-	-	-	-	-			
pH	-	11.26	9.82	9.26	8.88	8.20			
17 Addition, g	1.25	-	-						
Addition, kg/t	1.13	-	-						
Total Add.,kg/t	1.13	-	-						
pH	-	11.26	8.70						
18 Addition, g	1.25	-	-						
Addition, kg/t	1.13	-	-						
Total Add.,kg/t	1.13	-	-						
pH	-	11.77	10.05						
19 Addition, g	1.75	-	-	-					
Addition, kg/t	1.59	-	-	-					
Total Add.,kg/t	1.59	-	-	-					
pH	-	11.90	10.66	8.77					

Test No.	Leaching Time, hours							
	Start	1	2	3	4	5	24	48
20 Addition, g	1.25	-	-	-	-	-	0.25	-
Addition, kg/t	1.13	-	-	-	-	-	0.23	-
Total Add.,kg/t	1.13	-	-	-	-	-	1.36	-
pH	-	11.57	11.03	10.94	10.70	10.58	9.66	9.45
21 Addition, g	1.00	-	-	-	-	0.25	0.30	-
Addition, kg/t	0.91	-	-	-	-	0.23	0.27	-
Total Add.,kg/t	0.91	-	-	-	-	1.14	1.41	-
pH	-	10.57	10.35	10.34	10.23	10.19	9.42	8.97
22 Addition, g	1.00	-	-	-	-	0.25	0.51	-
Addition, kg/t	0.91	-	-	-	-	0.23	0.46	-
Total Add.,kg/t	0.91	-	-	-	-	1.14	1.60	-
pH	-	10.98	10.32	10.14	10.07	9.79	9.14	9.06
23 Addition, g	1.00	-	-	-	-	0.25	0.50	-
Addition, kg/t	0.91	-	-	-	-	0.23	0.45	-
Total Add.,kg/t	0.91	-	-	-	-	1.14	1.59	-
pH	-	11.08	10.43	10.21	10.14	9.97	9.39	9.26
24 Addition, g	1.00	-	-	-	-	0.25	0.30	-
Addition, kg/t	0.91	-	-	-	-	0.23	0.27	-
Total Add.,kg/t	0.91	-	-	-	-	1.14	1.41	-
pH	-	11.34	10.77	10.38	10.36	10.30	9.89	9.70
25 Addition, g	1.00	-	0.25	-	-	-	-	
Addition, kg/t	0.92	-	0.23	-	-	-	-	
Total Add.,kg/t	0.92	-	1.15	-	-	-	-	
pH	-	10.60	10.14	10.58	10.57	10.35	9.48	
26 Addition, g	1.00	-	0.25	-	-	-	-	
Addition, kg/t	0.91	-	0.23	-	-	-	-	
Total Add.,kg/t	0.91	-	1.14	-	-	-	-	
pH	-	10.65	10.14	10.56	10.55	10.35	9.50	
27 Addition, g	1.00	-	-	-	-	0.10	-	
Addition, kg/t	0.91	-	-	-	-	0.09	-	
Total Add.,kg/t	0.91	-	-	-	-	1.00	-	
pH	-	10.87	10.35	10.18	10.16	10.06	9.60	
28 Addition, g	1.00	-	-	0.28	-	-	-	
Addition, kg/t	0.91	-	-	0.25	-	-	-	
Total Add.,kg/t	0.91	-	-	1.16	-	-	-	
pH	-	10.76	10.23	10.06	10.74	10.48	9.44	
29 Addition, g	1.00	-	0.02	0.10	-	0.20	-	
Addition, kg/t	0.91	-	0.02	0.09	-	0.18	-	
Total Add.,kg/t	0.91	-	0.93	1.02	-	1.20	-	
pH	-	9.35	9.92	9.79	9.92	9.75	9.71	

Test No.	Min. Start	5	Leaching Time, hours 1	2	3	4	5	6	7
30 Addition, g	0.70	-	0.10	-	0.053	0.073	-	0.083	-
Addition, kg/t	0.64	-	0.09	-	0.05	0.07	-	0.08	-
Total Add.,kg/t	0.64	-	0.73	-	0.78	0.85	-	0.93	-
pH	-	10.34	9.69	10.13	10.08	10.04	10.17	10.00	-
31 Addition, g	0.50	-	0.10	-	-	0.054	0.07	-	-
Addition, kg/t	0.46	-	0.09	-	-	0.05	0.06	-	-
Total Add.,kg/t	0.46	-	0.55	-	-	0.60	0.66	-	-
pH	-	10.43	9.70	9.88	9.88	9.78	9.84	9.91	-
32 Addition, g	0.60	-	0.05	0.155	0.112	0.167	0.203	0.173	-
Addition, kg/t	0.54	-	0.05	0.14	0.10	0.15	0.18	0.16	-
Total Add.,kg/t	0.54	-	0.59	0.73	0.83	0.98	1.16	1.32	-
pH	-	8.56	9.38	9.28	9.38	9.48	9.64	9.86	10.13
33 Addition, g	0.60	-	0.05	0.158	0.09	0.116	0.131	0.144	-
Addition, kg/t	0.55	-	0.05	0.14	0.08	0.11	0.12	0.13	-
Total Add.,kg/t	0.55	-	0.60	0.74	0.82	0.93	1.05	1.18	-
pH	-	8.53	9.55	9.50	9.66	9.74	9.85	9.95	10.13
34 Addition, g	1.00	-	0.054	0.207	0.21	-	-	-	-
Addition, kg/t	0.91	-	0.05	0.19	0.19	-	-	-	-
Total Add.,kg/t	0.91	-	0.96	1.15	1.34	-	-	-	-
pH	-	9.04	9.58	9.50	9.83	10.30	10.15	10.10	10.10

Test No.	Leaching Time, hours 7.5	8	9	10	24	48
30 Addition, g	0.063	-	0.055	0.10	-	
Addition, kg/t	0.06	-	0.05	0.09	-	
Total Add.,kg/t	0.99	-	1.04	1.13	-	
pH	10.06	-	10.11	10.11	9.48	
31 Addition, g	0.07	-	0.075	0.104	-	
Addition, kg/t	0.06	-	0.07	0.09	-	
Total Add.,kg/t	0.72	-	0.79	0.88	-	
pH	9.73	-	9.77	9.87	9.28	
32 Addition, g	-	0.113	-	0.126	-	
Addition, kg/t	-	0.10	-	0.11	-	
Total Add.,kg/t	-	1.42	-	1.53	-	
pH	-	9.87	10.21	10.04	9.45	
33 Addition, g	-	0.09	-	0.14	0.244	-
Addition, kg/t	-	0.08	-	0.13	0.22	-
Total Add.,kg/t	-	1.26	-	1.39	1.61	-
pH	-	9.90	10.12	9.93	8.91	8.57
34 Addition, g	-	0.053	-	-		
Addition, kg/t	-	0.05	-	-		
Total Add.,kg/t	-	1.39	-	-		
pH	-	9.97	10.03	9.97		

APPENDIX 3

The amount of gold in solution, gold extracted, percentages of gold extracted during cyanidation and gold in tailing, ppm.

Test No.	Leaching Time, hours						
	24	48	72	96	120	144	168
1 In Solution, ppm	14.3	29.8	63.9	80.5	88.0	96.8	97.0
Extracted, ppm	21.5	43.9	92.7	114.7	123.2	133.1	131.1
Extracted, %	16.1	32.8	69.2	85.6	92.0	99.4	97.9
In Tailing, ppm							2.85
2 In Solution, ppm	31.3	55.9	90.3	91.3	96.0	109.0	100.0
Extracted, ppm	47.0	82.5	130.9	130.1	134.4	149.9	135.0
Extracted, %	33.5	58.8	93.4	92.8	95.9		96.3
In Tailing, ppm							5.2
3 In Solution, ppm	107.2	114.9					
Extracted, ppm	160.8	169.5					
Extracted, %	93.2	98.3					
In Tailing, ppm		2.95					
4 In Solution, ppm	85.0	93.5					
Extracted, ppm	127.5	137.9					
Extracted, %	92.0	99.6					
In Tailing, ppm		0.7					
5 In Solution, ppm	47.2	98.7	99.8				
Extracted, ppm	97.7	201.8	204.1				
Extracted, %	46.9	96.9	98.0				
In Tailing, ppm			4.15				
6 In Solution, ppm	80.9	89.0	90.7				
Extracted, ppm	150.5	163.3	166.4				
Extracted, %	89.2	96.8	98.6				
In Tailing, ppm			2.3				
7 In Solution, ppm	80.8	78.0					
Extracted, ppm	164.8	157.2					
Extracted, %		99.6					
In Tailing, ppm		0.65					
8 In Solution, ppm	126.5	127.6					
Extracted, ppm	189.8	188.0					
Extracted, %	99.0	98.1					
In Tailing, ppm		3.65					
9 In Solution, ppm	18.0	26.1	64.5	89.0			
Extracted, ppm	33.6	48.1	117.1	159.4			
Extracted, %	20.6	29.5	71.8	97.8			
In Tailing, ppm				3.65			
10 In Solution,ppm	90.2	94.3	97.1	97.1			
Extracted, ppm	156.5	161.3	163.6	161.2			
Extracted, %	95.5	98.5	99.9	98.			
In Tailing, ppm				2.55			
11 In Solution,ppm	15.5	23.1	34.7	74.0	-	81.9	
Extracted, ppm	28.1	41.4	61.3	128.9	-	140.6	
Extracted, %	19.8	29.2	43.2	90.8	-	99.1	
In Tailing, ppm						1.35	
12 In Solution,ppm	44.7	68.0	102.7	108.0			
Extracted, ppm	67.1	100.3	148.9	153.9			
Extracted, %	42.4	63.4	94.2	97.3			
In Tailing, ppm				4.2			

Test No.	Leaching Time, hours 24	48	72	96	120	144	168
13 In Solution,ppm	66.7	100.5	125.9	130.5			
Extracted, ppm	100.1	148.2	182.6	186.0			
Extracted, %	51.3	76.0	93.6	95.4			
In Tailing, ppm				9.0			
14 In Solution,ppm	97.8	106.0	113.9	115.9			
Extracted, ppm	146.7	156.3	165.2	165.2			
Extracted, %	87.6	93.4	98.7	98.7			
In Tailing, ppm				2.2			
15 In Solution,ppm	96.3	108.4	112.2	114.2			
Extracted, ppm	144.5	159.9	162.7	162.7			
Extracted, %	86.3	95.5	97.2	97.2			
In Tailing, ppm				4.75			
16 In Solution,ppm	102.7	113.0	119.5	121.6			
Extracted, ppm	154.1	166.7	173.3	173.3			
Extracted, %	85.3	92.3	96.0	96.0			
In Tailing, ppm				7.30			
17 In Solution,ppm	95.6						
Extracted, ppm	143.4						
Extracted, %	83.5						
In Tailing, ppm	28.65						
18 In Solution,ppm	142.0						
Extracted, ppm	213.0						
Extracted, %	94.2						
In Tailing, ppm	13.15						
19 In Solution,ppm	102.0	155.0					
Extracted, ppm	153.0	228.6					
Extracted, %	63.8	95.4					
In Tailing, ppm		11.1					

Test No.	Leaching Time, hours 1	2	3	4	24	48
20 In Solution,ppm	16.0	27.0	37.5	51.8	119.0	121.5
Extracted, ppm	24.0	39.8	54.4	73.8	166.6	167.1
Extracted, %	13.8	22.9	31.3	42.6	96.0	96.3
In Tailing, ppm						6.4
21 In Solution,ppm	11.6	22.8	31.3	40.8	98.0	129.5
Extracted, ppm	17.4	33.6	45.4	58.1	137.2	178.1
Extracted, %	9.1	17.5	23.6	30.3	71.5	92.8
In Tailing, ppm						13.9
22 In Solution,ppm	17.8	35.7	48.5	59.6	113.8	115.8
Extracted, ppm	26.7	52.7	70.3	84.9	159.3	159.2
Extracted, %	16.1	31.8	42.4	51.3	96.1	96.1
In Tailing, ppm						6.5
23 In Solution,ppm	16.0	31.9	45.3	58.5	113.6	114.9
Extracted, ppm	24.0	47.1	65.7	83.4	159.0	158.0
Extracted, %	14.5	28.5	39.7	50.4	96.2	95.6
In Tailing, ppm						6.3
24 In Solution,ppm	13.4	24.5	35.5	48.1	116.4	119.2
Extracted, ppm	20.1	36.1	51.5	68.5	163.0	163.9
Extracted, %	11.7	21.1	30.0	39.9	94.9	95.5
In Tailing, ppm						7.8
25 In Solution,ppm	15.8	25.0	32.8	43.7	116.3	
Extracted, ppm	23.7	36.9	47.6	62.3	162.8	
Extracted, %	13.6	21.1	27.3	35.7	93.3	
In Tailing, ppm					11.65	
26 In Solution,ppm	13.6	23.5	30.7	39.6	116.0	
Extracted, ppm	20.4	34.7	44.5	56.4	162.4	
Extracted, %	12.5	21.2	27.2	34.4	99.1	
In Tailing, ppm					1.5	
27 In Solution,ppm	10.1	27.2	40.6	53.0	128.7	
Extracted, ppm	15.2	40.1	58.9	75.5	180.2	
Extracted, %	8.1	21.3	31.3	40.2	95.8	
In Tailing, ppm					7.95	
28 In Solution,ppm	9.9	28.0	33.0	37.5	121.3	
Extracted, ppm	14.9	41.3	47.9	53.4	169.8	
Extracted, %	8.1	22.5	26.1	29.1	92.5	
In Tailing, ppm					13.75	
29 In Solution,ppm	18.0	32.3	47.0	58.0	110.6	
Extracted, ppm	27.0	47.6	68.2	82.7	154.8	
Extracted, %	16.8	29.6	42.3	51.3	96.1	
In Tailing, ppm					6.25	

Test No.	Leaching Time, hours 1	2	3	4	5	6	7	7.5
30 In Solution,ppm	13.0	30.1	46.5	60.6	71.2	78.1	-	89.0
Extracted, ppm	19.5	45.0	69.3	90.0	105.4	115.2	-	130.8
Extracted, %	11.3	26.0	40.0	52.0	60.9	66.6	-	75.6
In Tailing, ppm								
31 In Solution,ppm	11.3	25.8	39.5	51.3	61.4	67.9	-	77.1
Extracted, ppm	17.0	38.6	58.9	76.2	90.9	100.2	-	113.3
Extracted, %	9.3	21.1	32.2	41.7	49.7	54.8	-	62.0
In Tailing, ppm								
32 In Solution,ppm	35.3	82.2	115.3	132.0	152.3	162.3	165.0	-
Extracted, ppm	53.0	122.9	171.8	196.0	225.4	239.4	242.6	-
Extracted, %	20.8	48.3	67.5	77.0	88.5	94.0	95.3	-
In Tailing, ppm								
33 In Solution,ppm	14.8	35.1	48.8	56.3	64.8	73.8	78.7	-
Extracted, ppm	22.2	52.5	72.7	83.6	95.9	108.9	115.7	-
Extracted, %	13.3	31.3	43.4	49.9	57.2	65.0	69.0	-
In Tailing, ppm								
34 In Solution,ppm	39.3	83.6	129.7	137.0	150.8	155.8	168.7	-
Extracted, ppm	59.0	125.0	193.3	203.5	220.2	226.7	244.6	-
Extracted, %	22.9	48.5	75.0	79.0	85.5	88.0	95.0	-
In Tailing, ppm								

Test No.	Leaching Time, hours 8	9	10	24	48
30 In Solution,ppm	-	90.7	96.0	111.0	
Extracted, ppm	-	132.9	140.2	161.5	
Extracted, %	-	76.8	81.0	93.3	
In Tailing, ppm				11.6	
31 In Solution,ppm	-	82.3	87.5	112.7	
Extracted, ppm	-	120.6	127.8	164.0	
Extracted, %	-	65.9	69.9	89.7	
In Tailing, ppm				18.9	
32 In Solution,ppm	166.5	168.0	168.8	169.0	
Extracted, ppm	243.9	245.3	245.6	245.6	
Extracted, %	95.8	96.3	96.5	96.5	
In Tailing, ppm				9.0	
33 In Solution,ppm	82.5	86.9	89.2	103.5	111.1
Extracted, ppm	120.9	126.9	129.8	150.1	158.3
Extracted, %	72.1	75.7	77.5	89.6	94.5
In Tailing, ppm					9.25
34 In Solution,ppm	170.0	173.9	175.1		
Extracted, ppm	245.7	246.9	247.8		
Extracted, %	95.4	95.9	96.2		
In Tailing, ppm			9.8		

APPENDIX 4

Analysis of cyanide leach for other elements

Test No.	ppm Ag	Cu	Co	Cd	Ni	Mn	Fe	Zn	Pb
1 In Sol	6.1	205.2	18.70	<0.002	61.0	<0.05	631.0	0.08	<0.05
Extracted	8.2	277.0	25.25	-	82.4	-	851.9	0.11	-
2 In Sol	7.3	150.8	2.84	0.009	37.0	0.34	119.0	12.60	<0.05
Extracted	9.9	203.6	3.83	0.012	50.0	0.46	160.7	17.00	-
3 In Sol	9.3	274.0	3.28	0.045	27.0	0.16	6.8	20.20	<0.05
Extracted	13.7	404.2	4.84	0.066	39.8	0.24	10.0	29.80	-
4 In Sol	8.8	212.5	3.37	0.052	27.0	0.37	10.1	18.10	<0.05
Extracted	13.0	313.4	4.97	0.077	39.8	0.55	14.9	26.70	-
5 In Sol	5.4	203.0	13.00	0.014	54.0	<0.05	37.1	0.04	<0.05
Extracted	11.0	415.1	26.59	0.029	110.4	-	75.9	0.08	-
6 In Sol	7.1	147.4	9.63	0.026	39.7	<0.05	44.6	0.11	<0.05
Extracted	13.0	270.5	17.67	0.048	72.9	-	81.8	0.20	-
7 In Sol	6.5	92.6	5.41	0.041	22.8	<0.05	30.0	7.20	<0.05
Extracted	13.1	186.6	10.90	0.083	45.9	-	60.5	14.50	-
8 In Sol	8.4	254.0	2.85	0.365	41.6	<0.05	21.9	22.10	<0.05
Extracted	12.4	374.7	4.20	0.538	61.4	-	32.3	32.60	-
9 In Sol	6.1	124.3	12.10	0.008	51.1	<0.05	51.6	0.04	<0.05
Extracted	10.8	219.5	21.37	0.014	90.2	-	91.1	0.07	-
10 In So	5.5	140.4	11.90	<0.002	34.7	<0.05	59.7	0.06	<0.05
Extracted	9.0	229.6	19.46	-	56.7	-	97.6	0.10	-
11 In So	6.8	161.0	10.21	0.068	44.0	<0.05	32.9	2.50	<0.05
Extracted	11.7	276.4	17.53	0.117	75.5	-	56.5	4.30	-
12 In So	7.5	290.0	4.30	0.016	55.9	0.05	48.5	20.30	<0.05
Extracted	10.5	406.0	6.02	0.022	78.3	0.07	67.9	28.42	-
13 to 16 In Sol	6.4	180.0	3.87	0.006	46.8	<0.05	33.4	12.80	<0.05
Extracted	9.1	256.5	5.52	0.009	66.7	-	47.6	18.24	-
17 In Sol	3.0	196.0	5.83	<0.002	71.7	<0.05	36.5	0.02	<0.05
Extracted	4.5	294.0	8.75	-	107.6	-	54.8	0.03	-
18 In Sol	8.1	194.0	1.93	0.010	34.7	0.13	17.7	15.00	<0.05
Extracted	12.2	291.0	2.90	0.015	52.1	0.20	26.6	22.50	-
19 In Sol	11.9	209.0	6.07	0.025	58.7	0.60	88.3	24.00	<0.05
Extracted	17.6	308.3	8.95	0.037	86.6	0.89	130.2	35.40	-
20 In Sol	9.0	203.0	2.76	0.022	38.5	<0.05	32.0	13.60	<0.05
Extracted	12.4	279.1	3.80	0.030	52.9	-	44.0	18.70	-
21 In Sol	2.3	285.0	11.60	<0.002	95.1	<0.05	82.1	0.03	<0.05
Extracted	3.2	391.9	16.00	-	130.8	-	112.9	0.04	-
22 In Sol	7.3	279.0	3.22	0.013	46.0	<0.05	23.7	22.00	<0.05
Extracted	10.0	383.6	4.43	0.018	63.3	-	32.6	30.30	-
23 In Sol	7.3	220.0	2.73	0.016	37.2	<0.05	30.0	25.00	<0.05
Extracted	10.0	302.5	3.75	0.022	51.2	-	41.3	34.38	-
24 In Sol	7.5	160.0	2.04	0.014	33.2	0.33	24.8	13.20	<0.05
Extracted	10.3	220.0	2.81	0.019	45.7	0.45	34.1	18.20	-
25 In Sol	7.1	194.0	2.26	0.017	34.4	0.17	25.2	14.40	<0.05
Extracted	9.9	271.6	3.16	0.024	48.2	0.24	35.3	20.20	-
26 In Sol	6.9	210.0	2.19	0.014	33.9	0.30	24.1	19.20	<0.05
Extracted	9.7	294.0	3.07	0.020	47.5	0.42	33.7	26.90	-
27 In Sol	7.5	203.0	2.06	0.020	33.5	0.45	24.7	14.40	<0.05
Extracted	10.5	284.2	2.88	0.028	46.9	0.63	34.6	20.20	-

Test No.	ppm Ag	Cu	Co	Cd	Ni	Mn	Fe	Zn	Pb
28 In Sol	7.6	250.0	2.28	0.042	37.8	0.11	18.0	16.80	<0.05
Extracted	10.6	350.0	3.19	0.059	52.9	0.15	25.2	23.52	-
29 In Sol	7.1	148.0	2.25	0.017	40.0	0.43	30.0	12.40	<0.05
Extracted	9.9	207.2	3.15	0.024	56.0	0.60	42.0	17.36	-
30 In Sol	7.8	114.0	2.26	0.011	40.3	0.44	23.2	11.80	<0.05
Extracted	11.4	165.9	3.29	0.016	58.6	0.64	33.8	17.17	-
31 In Sol	7.0	169.0	2.53	0.012	44.7	<0.05	26.7	14.20	<0.05
Extracted	10.2	245.9	3.68	0.018	65.0	-	38.9	20.66	-
32 In Sol	11.0	36.7	2.67	0.050	64.0	0.59	26.9	4.20	<0.05
Extracted	16.0	53.2	3.87	0.073	92.8	0.86	39.0	6.09	-
33 In Sol	4.6	70.0	3.16	0.014	130.0	0.04	107.9	13.30	<0.05
Extracted	6.6	99.8	4.50	0.020	185.3	0.06	153.8	18.95	-
34 In Sol	9.2	27.4	1.63	0.042	47.4	2.06	13.6	3.30	<0.05
Extracted	13.0	38.8	2.31	0.059	67.1	2.92	19.2	4.67	-

APPENDIX 5

Summary of grinding, cyanidation conditions and gold extractions achieved

Test No.	Leaching Time, hours								
	Start	1	24	48	72	96	120	144	168
1:									
Size	80.5% minus 11.3 microns								
Condition time.	1								
Aerated, hrs.	-								
Lime total,kg/	1.81	2.26	3.17	4.98	-	5.89	6.80	7.71	-
pH	-	9.90	8.90	8.60	10.10	9.80	10.00	9.70	9.60
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	-
NaCN Total cons., kg/t	-	-	0.84	2.52	4.94	7.61	8.58	9.42	10.25
% Au extracted	-	-	16.1	32.8	69.2	85.6	92.0	99.4	97.9
2:									
Size	72.0% minus 250 microns								
Condition time,hr.	1								
Aerated, hrs.	-								
Lime total,kg/t	1.81	-	-	-	-	-	-	-	-
pH	-	11.80	11.00	10.70	10.60	10.50	10.50	10.50	10.40
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	-
NaCN Total cons., kg/t	-	-	0.65	0.67	1.68	1.75	1.93	2.38	2.63
% Au extracted	-	-	33.5	58.8	93.4	92.8	95.9		96.3
3:									
Size	80.9% minus 63 microns								
Condition time,hr.	1								
Aerated, hrs.	1								
Lime total,kg/t	3.63	-	5.44	-					
pH	-	11.80	10.10	10.60					
H_2O_2 add.,kg/t	-	-	-	-					
NaCN Total cons., kg/t	-	-	1.95	2.14					
% Au extracted	-	-	93.2	98.3					
4:									
Size	80.8% minus 45 microns								
Condition time,hr.	1								
Aerated, hrs.	1								
Lime total,kg/t	3.63	-	5.44	-					
pH	-	11.60	10.00	10.50					
H_2O_2 add.,kg/t	-	-	-	-					
NaCN Total cons., kg/t	-	-	1.52	2.16					
% Au extracted	-	-	92.0	99.6					
5:									
Size	80.2% minus 6.7 microns								
Condition time,hr.	1								
Aerated, hrs.	1								
Lime total,kg/t	2.72	5.44	9.98	-	-				
pH	-	7.80	8.50	10.50	9.20				
H_2O_2 add.,kg/t	-	-	-	-	-				
NaCN Total cons., kg/t	-	-	2.58	4.02	4.95				
% Au extracted	-	-	46.9	96.9	98.0				

Test No.	Leaching Time, hours								
	Start	1	24	48	72	96	120	144	168
6:									
Size	82.8% minus 9.5 microns								
Condition time,hr	1								
Aerated, hrs.	1								
Lime total,kg/t	5.44	7.25	9.06	-	-				
pH	-	8.60	9.80	10.50	9.20				
H_2O_2 add.,kg/t	-	-	-	-	-				
NaCN Total cons., kg/t	-	-	2.11	3.47	4.08				
% Au extracted	-	-	89.2	96.8	98.6				
7:									
Size	77.6% minus 8.0 microns								
Condition time,hr	1								
Aerated, hrs.	1								
Lime total,kg/t	7.26	9.07	9.98	-					
pH	-	9.80	10.40	10.40					
H_2O_2 add.,kg/t	-	-	-	-					
NaCN Total cons., kg/t	-	-	1.87	2.58					
% Au extracted	-	-		99.6					
8:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	1								
Lime total,kg/t	1.81	-	3.62	-					
pH	-	11.70	9.50	10.20					
H_2O_2 add.,kg/t	-	-	-	-					
NaCN Total cons., kg/t	-	-	1.54	2.61					
% Au extracted	-	-	99.0	98.1					
9:									
Size	82.6% minus 19 microns								
Condition time,hr	1								
Aerated, hrs.	1								
Lime total,kg/t	9.07	-	-	-	-	-			
pH	-	11.80	11.70	11.40	10.50	9.90			
H_2O_2 add.,kg/t	-	-	-	-	-	-			
NaCN Total cons., kg/t	-	-	0.60	1.19	1.72	3.06			
% Au extracted	-	-	20.6	29.5	71.8	97.8			
10:									
Size	79.4% minus 9.5 microns								
Condition time,hr	1								
Aerated, hrs.	1								
Lime total,kg/t	9.07	10.88	11.79	-	12.70	-			
pH	-	9.90	10.30	10.20	9.70	9.70			
H_2O_2 add.,kg/t	-	-	-	-	-	-			
NaCN Total cons., kg/t	-	-	1.52	2.35	2.89	4.16			
% Au extracted	-	-	95.5	98.5	99.9	98.4			

Test No.	Leaching Time, hours							
	Start	1	24	48	72	96	120	144	168
11:									
Size	83.5% minus 16 microns								
Condition time,hr	1								
Aerated, hrs.	1								
Lime total,kg/t	9.07	-	-	-	-	-	-	-	
pH	-	12.00	11.80	11.70	11.00	10.60	-	9.40	
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	
NaCN Total cons., kg/t	-	-	0.70	1.40	1.78	2.53	-	3.07	
% Au extracted	-	-	19.8	29.2	43.2	90.8	-	99.1	
12:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	2.72	-	-	-	3.63	-			
pH	-	12.00	11.60	11.50	9.30	10.50			
H_2O_2 add.,kg/t	-	-	-	-	-	-			
NaCN Total cons., kg/t	-	-	0.84	1.38	2.01	2.24			
% Au extracted	-	-	42.4	63.4	94.2	97.3			
13:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	2.27	-	-	-	-	-			
pH	-	11.81	11.18	10.68	10.02	9.80			
H_2O_2 add.,kg/t	-	-	-	-	-	-			
NaCN Total cons., kg/t	-	-	0.43	1.26	1.43	1.61			
% Au extracted	-	-	51.3	76.0	93.6	95.4			
14:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	1.59	-	-	-	-	-			
pH	-	11.58	9.67	8.88	8.25	8.08			
H_2O_2 add.,kg/t	-	-	-	-	-	-			
NaCN Total cons., kg/t	-	-	1.16	1.90	2.45	2.51			
% Au extracted	-	-	87.6	93.4	98.7	98.7			
15:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	1.36	-	-	-	-	-			
pH	-	11.50	10.25	9.65	9.24	8.82			
H_2O_2 add.,kg/t	-	-	-	-	-	-			
NaCN Total cons., kg/t	-	-	1.16	1.42	1.85	2.12			
% Au extracted	-	-	86.3	95.5	97.2	97.2			

Test No.	Leaching Time, hours							
	Start	1	24	48	72	96	120	144	168
16:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	1.13	-	-	-	-	-			
pH	-	11.26	9.82	9.26	8.88	8.20			
H_2O_2 add.,kg/t	-	-	-	-	-	-			
NaCN Total cons., kg/t	-	-	1.13	1.77	2.20	2.49			
% Au extracted	-	-	85.3	92.3	96.0	96.0			
17:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs. with	compressed air, 0.5L/min. for duration of test								
Lime total,kg/t	1.13	-	-						
pH	-	11.26	8.70						
H_2O_2 add.,kg/t	-	-	-						
NaCN Total cons., kg/t	-	-	1.61						
% Au extracted	-	-	83.5						
18:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	1.13	-	-						
pH	-	11.77	10.05						
H_2O_2 add.,kg/t	0.45	-	-						
NaCN Total cons., kg/t	-	-	0.86						
% Au extracted	-	-	94.2						
19:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs. with	compressed air, 0.5L/min. for duration of test								
Lime total,kg/t	1.59	-	-	-					
pH	-	11.90	10.66	8.77					
H_2O_2 add.,kg/t	-	-	-	-					
NaCN Total cons., kg/t	-	-	1.35	2.39					
% Au extracted	-	-	63.8	95.4					
20:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	1.13	-	-	-	-	-	1.36	-	
pH	-	11.57	11.03	10.94	10.70	10.58	9.66	9.45	
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	
NaCN Total cons., kg/t	-	-	0.29	0.40	0.45	0.59	1.45	2.48	
% Au extracted	-	-	13.8	22.9	31.3	42.6	96.0	96.3	

Test No.	Leaching Time, hours							
	Start	1	24	48	72	96	120	144	168
21:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs. with	compressed air, 0.5L/min. for duration of test								
Lime total,kg/t	0.91	-	-	-	-	1.14	1.41	-	
pH	-	10.57	10.35	10.34	10.23	10.19	9.42	8.97	
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	
NaCN Total cons., kg/t	-	-	0.40	0.72	0.83	1.07	2.40	3.12	
% Au extracted	-	-	9.1	17.5	23.6	30.3	71.3	92.8	
22:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	0.91	-	-	-	-	1.14	1.60	-	
pH	-	10.98	10.32	10.14	10.07	9.79	9.14	9.06	
H_2O_2 add.,kg/t	0.45	-	-	-	-	-	-	-	
NaCN Total cons., kg/t	-	-	0.50	0.65	0.71	1.15	1.79	2.14	
% Au extracted	-	-	16.1	31.8	42.4	51.3	96.1	96.1	
23:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	0.91	-	-	-	-	1.14	1.59	-	
pH	-	11.08	10.43	10.21	10.14	9.97	9.39	9.26	
H_2O_2 add.,kg/t	0.91	-	-	-	-	-	-	-	
NaCN Total cons., kg/t	-	-	0.34	0.52	0.65	1.05	1.64	1.98	
% Au extracted	-	-	14.5	28.5	39.7	50.4	96.2	95.6	
24:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	0.91	-	-	-	-	1.14	1.41	-	
pH	-	11.34	10.77	10.38	10.36	10.30	9.89	9.70	
H_2O_2 add.,kg/t	0.23	-	-	-	-	-	-		
NaCN Total cons., kg/t	-	-	0.18	0.41	0.51	0.90	1.34	1.64	
% Au extracted	-	-	11.7	21.1	30.0	39.9	94.9	95.5	
25:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	0.92	-	1.15	-	-	-	-		
pH	-	10.60	10.14	10.58	10.57	10.35	9.48		
H_2O_2 add.,kg/t	0.68	-	-	-	-	-	-		
NaCN Total cons., kg/t	-	-	0.35	0.56	0.67	0.97	1.79		
% Au extracted	-	-	13.6	21.1	27.3	35.7	93.3		

Test No.	Leaching Time, hours								
	Start	1	24	48	72	96	120	144	168
26:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	0.91	-	1.14	-	-	-	-		
pH	-	10.65	10.14	10.56	10.55	10.35	9.50		
H_2O_2 add.,kg/t	1.36	-	-	-	-	-	-		
NaCN Total cons., kg/t	-	-	0.28	0.55	0.60	1.01	1.80		
% Au extracted	-	-	12.5	21.2	27.2	34.4	99.1		
27:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	0.91	-	-	-	-	1.00	-		
pH	-	10.87	10.35	10.18	10.16	10.06	9.60		
H_2O_2 add.,kg/t	1.81	-	-	-	-	-	-		
NaCN Total cons., kg/t	-	-	0.24	0.53	0.64	1.08	1.72		
% Au extracted	-	-	8.1	21.3	31.3	40.2	95.8		
28:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	-								
Lime total,kg/t	0.91	-	-	1.16	-	-	-		
pH	-	10.76	10.23	10.06	10.74	10.48	9.44		
H_2O_2 add.,kg/t	3.63	-	-	-	-	-	-		
NaCN Total cons., kg/t	-	-	0.25	0.63	0.66	0.97	1.84		
% Au extracted	-	-	8.1	22.5	26.1	29.1	92.5		
29:									
Size	72.0% minus 250 microns								
Condition time,hr	1								
Aerated, hrs.	1								
Lime total,kg/t	0.91	-	0.93	1.02	-	1.20	-		
pH	-	9.35	9.92	9.79	9.92	9.75	9.71		
H_2O_2 add.,kg/t	-	-	-	-	-	-	-		
NaCN Total cons., kg/t	-	-	0.43	0.60	0.71	0.95	1.53		
% Au extracted	-	-	16.8	29.6	42.3	51.3	96.1		

Test No.	Leaching Time, hours								
	Start	1	2	3	4	5	6	7	7.5
30:									
Size	72.0% minus 250 microns								
Condition time	5 min								
Aerated, hrs.	-								
Lime total,kg/t	0.64	-	0.73	-	0.78	0.85	-	0.93	-
pH	-	10.34	9.69	10.13	10.08	10.04	10.17	10.00	-
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	-	-	-	-	-
% Au extracted	-	-	11.3	26.0	40.0	52.0	60.9	66.6	-
31:									
Size	72.0% minus 250 microns								
Condition time	5 min								
Aerated, hrs.	-								
Lime total,kg/t	0.46	-	0.55	-	-	0.60	0.66	-	-
pH	-	10.43	9.70	9.88	9.88	9.78	9.84	9.91	-
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	-	-	-	-	-
% Au extracted	-	-	9.3	21.1	32.2	41.7	49.7	54.8	-
32:									
Size	74.0% minus 250 microns								
Condition time	5 min								
Aerated, hrs.	-								
Lime total,kg/t	0.54	-	0.59	0.73	0.83	0.98	1.16	1.32	-
pH	-	8.56	9.38	9.28	9.38	9.48	9.64	9.86	10.13
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	-	-	-	-	-
% Au extracted	-	-	20.8	48.3	67.5	77.0	88.5	94.0	95.3
33:									
Size	74.0% minus 500 microns								
Condition time	5 min								
Aerated, hrs.	-								
Lime total,kg/t	0.55	-	0.60	0.74	0.82	0.93	1.05	1.18	-
pH	-	8.53	9.55	9.50	9.66	9.74	9.85	9.95	10.13
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	-	-	-	-	-
% Au extracted	-	-	13.3	31.3	43.4	49.9	57.2	65.0	69.0
34:									
Size	74.0% minus 250 microns								
Condition time	5 min								
Aerated, hrs.	-								
Lime total,kg/t	0.91	-	0.96	1.15	1.34	-	-	-	-
pH	-	9.04	9.58	9.50	9.83	10.30	10.15	10.10	10.10
H_2O_2 add.,kg/t	-	-	-	-	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	-	0.66	-	-	-
% Au extracted	-	-	22.9	48.5	75.0	79.0	85.5	89.0	95.0

Test No.	Leaching Time, hours				
	8	9	10	24	48
30:					
Size					
Condition time					
Aerated, hrs.					
Lime total,kg/t	0.99	-	1.04	1.13	-
pH	10.06	-	10.11	10.11	9.48
H_2O_2 add.,kg/t	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	1.51
% Au extracted	75.6	-	76.8	81.0	93.3
31:					
Size					
Condition time					
Aerated, hrs.					
Lime total,kg/t	0.72	-	0.79	0.88	-
pH	9.73	-	9.77	9.87	9.28
H_2O add.,kg/t	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	1.79
% Au extracted	62.0	-	65.9	69.9	89.7
32:					
Size					
Condition time					
Aerated, hrs.					
Lime total,kg/t	-	1.42	-	1.53	-
pH	-	9.87	10.21	10.04	9.45
H_2O_2 add.,kg/t	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	1.65
% Au extracted	-	95.8	96.3	96.5	96.5
33:					
Size					
Condition time					
Aerated, hrs.					
Lime total,kg/t	-	1.26	-	1.39	1.61
pH	-	9.90	10.12	9.93	8.91
H_2O_2 add.,kg/t	-	-	-	-	-
NaCN Total cons., kg/t	-	-	-	-	2.32
% Au extracted	-	72.1	75.7	77.5	89.6
34:					
Size					
Condition time					
Aerated, hrs.					
Lime total,kg/t	-	1.39	-	-	
pH	-	9.97	10.03	9.97	
H_2O_2 add.,kg/t	-	-	-	-	
NaCN Total cons., kg/t	-	0.88	-	1.00	
% Au extracted	-	95.4	95.9	96.2	